Check List the journal of biodiversity data

NOTES ON GEOGRAPHIC DISTRIBUTION

Check List 19 (5): 669–674
https://doi.org/10.15560/19.5.669

PENSOFT

First record of *Microvelia albonotata* Champion, 1898 (Hemiptera, Heteroptera, Gerridae) from a cave in Colombia

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Abstract. *Microvelia albonotata* Champion, 1898 (Hemiptera, Heteroptera, Gerridae) is a small semiaquatic bug distributed from southeastern Canada to Peru, including the West Indies. Despite this wide range and an easy identification of male specimens, it was recorded for the first time from Colombia only in 2021. Here, we report this species from the country once more, this time based on material collected in a cave in the department of Boyacá.

Keywords. Cave insects, geographic distribution, Neotropical Region, semiaquatic bugs

Academic editor: Julianna Freires Barbosa
Received 15 June 2023, accepted 21 September 2023, published 3 October 2023

Arias EAA, Morales I, Moreira FFF (2023) First record of *Microvelia albonotata* Champion, 1898 (Hemiptera, Heteroptera, Gerridae) from a cave in Colombia. Check List 19 (5): 669–674. https://doi.org/10.15560/19.5.669

Introduction

Insects can inhabit caves, which are characterized by high environmental stability and a permanent absence of light. These spaces generally have continuity with epigeous environments and are susceptible to colonization by pre-adapted species (Trajano and Bichuette 2006; Ortuño 2011; Sánchez and Lobo 2016). In Colombia, about 360 geological formations associated with subterranean ecosystems are known, and 321 cavities have been recorded from the Andean region (Zafra-Otero 2021). Despite the importance of these ecosystems, few studies have focused on the cave entomofauna of the country (e.g. Marinkelle 1982; Casallas-Pabón et al. 2013; González et al. 2017; Aristizábal-García et al. 2018; Barriga et al. 2019; Angarita-Sierra et al. 2019; Morales and Amado 2021; Aristizábal-García et al. 2021).

One of the groups of insects reported from caves is the infraorder Gerromorpha (Hemiptera, Heteroptera) or semiaquatic bugs, which contains more than 2100 species worldwide, distributed in eight families and over 160 genera (Moreira 2015). In the Neotropical Region, some species of Gerromorpha have been recorded from caves, but only a few of them are found exclusively in these environments, such as *Microvelia cavernula* Polhemus, 1972 (Gerridae), and *Spelaeometra gruta* Polhemus & Ferreira, 2018 and *Cephalometra pallida* Polhemus & Ferreira, 2018 (Hydrometridae) (Polhemus 1972; Polhemus and Ferreira 2018).

In South America, Gil-Santana et al. (2022) summarized the knowledge on the cave-inhabiting true bugs, including the aquatic (Nepomorpha) and semiaquatic (Gerromorpha) bugs, from Brazil; notwithstanding, there are few studies focusing solely on cave-inhabiting gerromorphans (e.g. Polhemus and Ferreira 2018; Magalhães et al. 2021). In Colombia, the only record of a semiaquatic bug from hypogeous ecosystems refers to *Stridulivelia cinctipes* (Champion, 1898) (Gerromorpha, Veliidae), which was collected in the department of Santander (Aristizábal-García et al. 2018). Due to the scarce knowledge on the cave entomofauna of Colombia, we provide here the first record of a small semiaquatic bug, *Microvelia albonotata* (Champion, 1898) (Gerridae), from a cave in the Eastern Andes of Colombia.

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Microvelia albonotata is widely distributed from southeastern Canada (Scudder 1987) to Peru (Drake and Hussey 1955), including several Caribbean islands (Wetmore 1916; Drake and Maldonado-Capriles 1956; Miskimen and Bond 1970; Nieser 1977; Peck 1992). This species has been previously recorded from caves in Florida (United States) (Smith 1980) and Jamaica (Peck 1992), and it has been recently reported for the first time from Colombia based on material collected in open environments (Rodrigues et al. 2021).

Methods

An expedition was conducted to Miravalle Cave (05° 55′22″N, 073°36′18″W), located in the municipality of Moniquirá, department of Boyacá, on the eastern range of the Colombian Andes (Fig. 1). The cave is at an elevation of 1620 m within the Paja formation and is comprised of calcareous rocks (Gama et al. 2011). The cave has an entrance of 70 × 60 cm (Fig. 2A–C), an approximate length of 2.5 km, a maximum depth of 60 m underground, stalagmites and stalactites, and a body of water fed by percolation (Fig. 2D). The cave reaches 3 m wide by 4 m high in the water-storing areas (Fig. 2E).

Specimens were collected manually with entomological nets and a sampling effort of 3-person hours. Samples were transferred to the Laboratorio de Entomología, Universidad Pedagógica y Tecnológica de Colombia, for taxonomic determination, then deposited in the Colección de Insectos, Museo de Historia Natural "Luis Gonzalo Andrade", Universidad Pedagógica y Tecnológica de Colombia, Tunja, Colombia (UPTC). Photos of the specimens were taken on a Leica S9i stereomicroscope with a camera attached, using the software LAS EZ v. 3.4.0. QGIS v. 3.22.10 (QGIS Development Team 2021) was used for the preparation of the map.

Results

***Microvelia albonotata* (Champion, 1898)**

Figure 3

New record. COLOMBIA – **Boyacá** • Moniquirá, sector Miravalle, Cueva Miravalle, vereda El Naranjal; 05°55′22″N, 073°36′18″W; alt. 1618 m; 18.VIII.2022; E. Arias & V. Gaviria leg.; 3 ♂, 9 ♀; UPTC-In-29776.

Identification. Our males of *M. albonotata* were easily identified due to the presence of a large acute tubercle on abdominal sternum II and spinules on the inner face of the hind femur (Fig. 3C, D). Females do not display these features, but they have a similar color pattern and the same condition of the pronotum as in the males, covering the mesonotum but not the metanotum (Fig. 3A, B).

Habitat. Specimens were collected 100 m from the cave entrance in a lentic waterbody with muddy substrate (Fig. 2E). The water depth was 0.1–0.5 m at the waterbody's center.

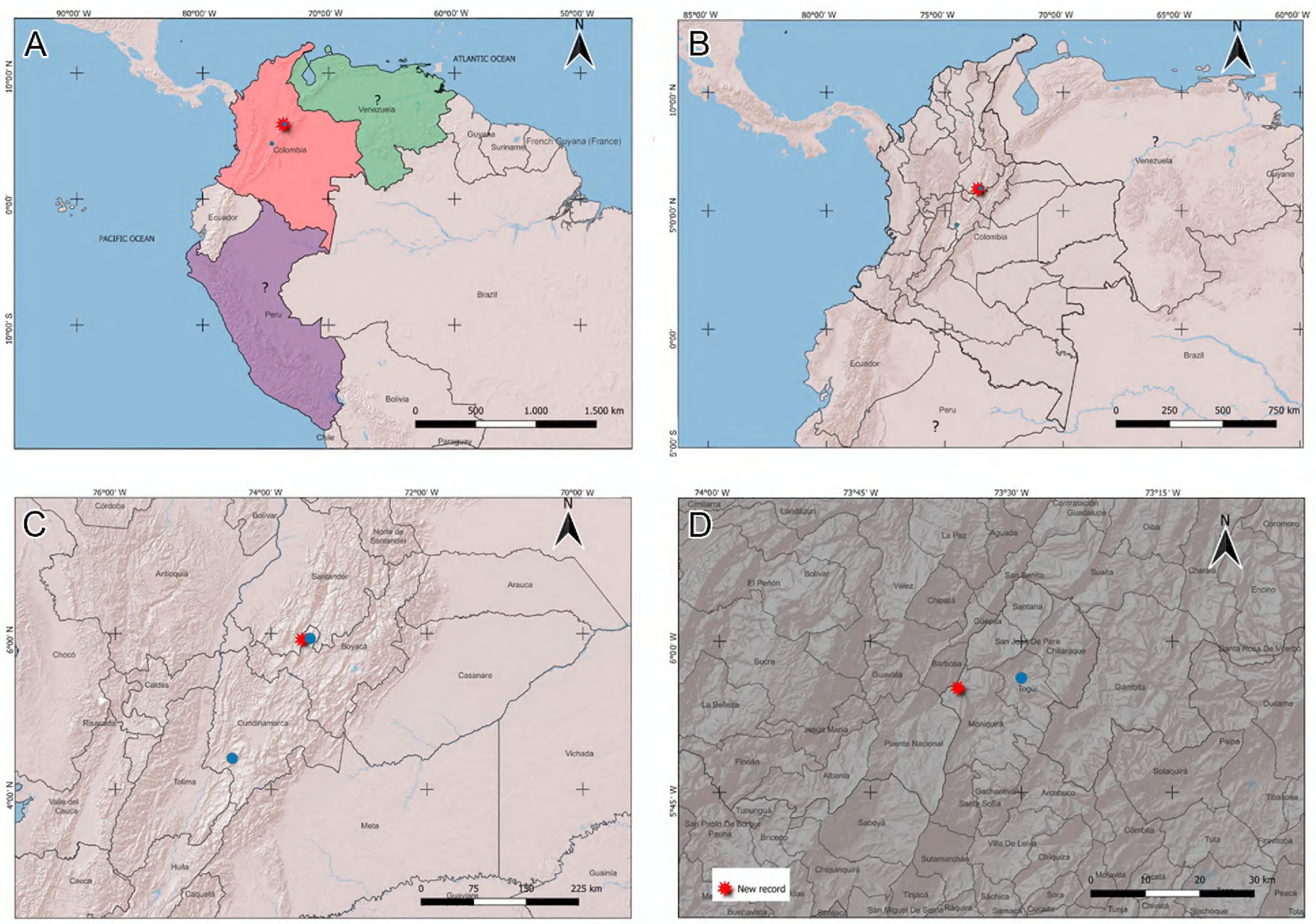

Figure 1. A–D. Geographic distribution of *Microvelia albonotata* in South America. Previous records from Venezuela and Peru did not include locality details. Blue dots indicate previous records from Colombia and red asterisk indicates the new record provided here.

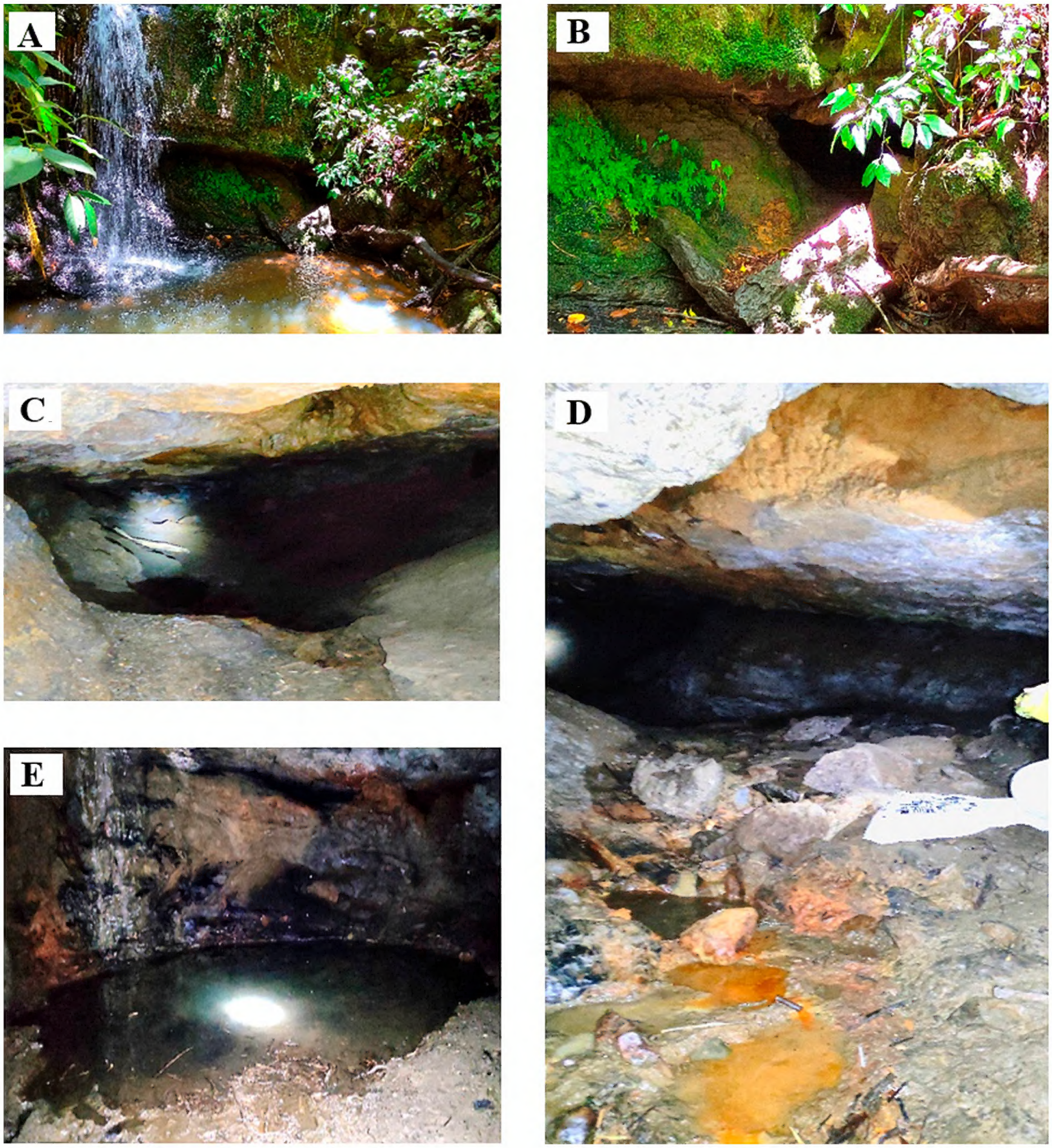

Figure 2. Miravalle Cave, Boyacá, Colombia. **A.** Body of water outside the cave. **B.** Cave entrance. **C.** Inside cave mouth. **D.** Interior of the cave. **E.** Microhabitat of *Microvelia albonotata*.

Discussion

The genus *Microvelia* Westwood, 1834 contains more than 170 species; it is one of the most diverse genera within Gerromorpha (Aristizábal-García 2017). Some *Microvelia* species are negatively phototropic, occupying cryptic habitats and displaying nocturnal activity (Polhemus 1974). Such characteristics probably constitute a pre-adaptation that allows them to colonize hypogeous environments, at least opportunistically (Magalhães et al. 2021; Gil-Santana et al. 2022). Specimens of *M. albonotata* reported in the present study were found feeding and reproducing inside a cave in the department of Boyacá, thus providing further evidence of the troglophile condition of this species, which is capable of maintaining populations both inside and outside cave systems.

Acknowledgements

This article benefited from critical reviews provided by Dr. Daniel Reynoso-Velasco (Instituto de Ecología, Xalapa, Mexico), Dr. Higor Daniel Duarte Rodrigues (Fundação Oswaldo Cruz, Rio de Janeiro, Brazil), and Dr. Julianna Freires Barbosa (Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil). EAAA and IM thank the project: "The biodiversity of Boyacá: Complementation and synthesis

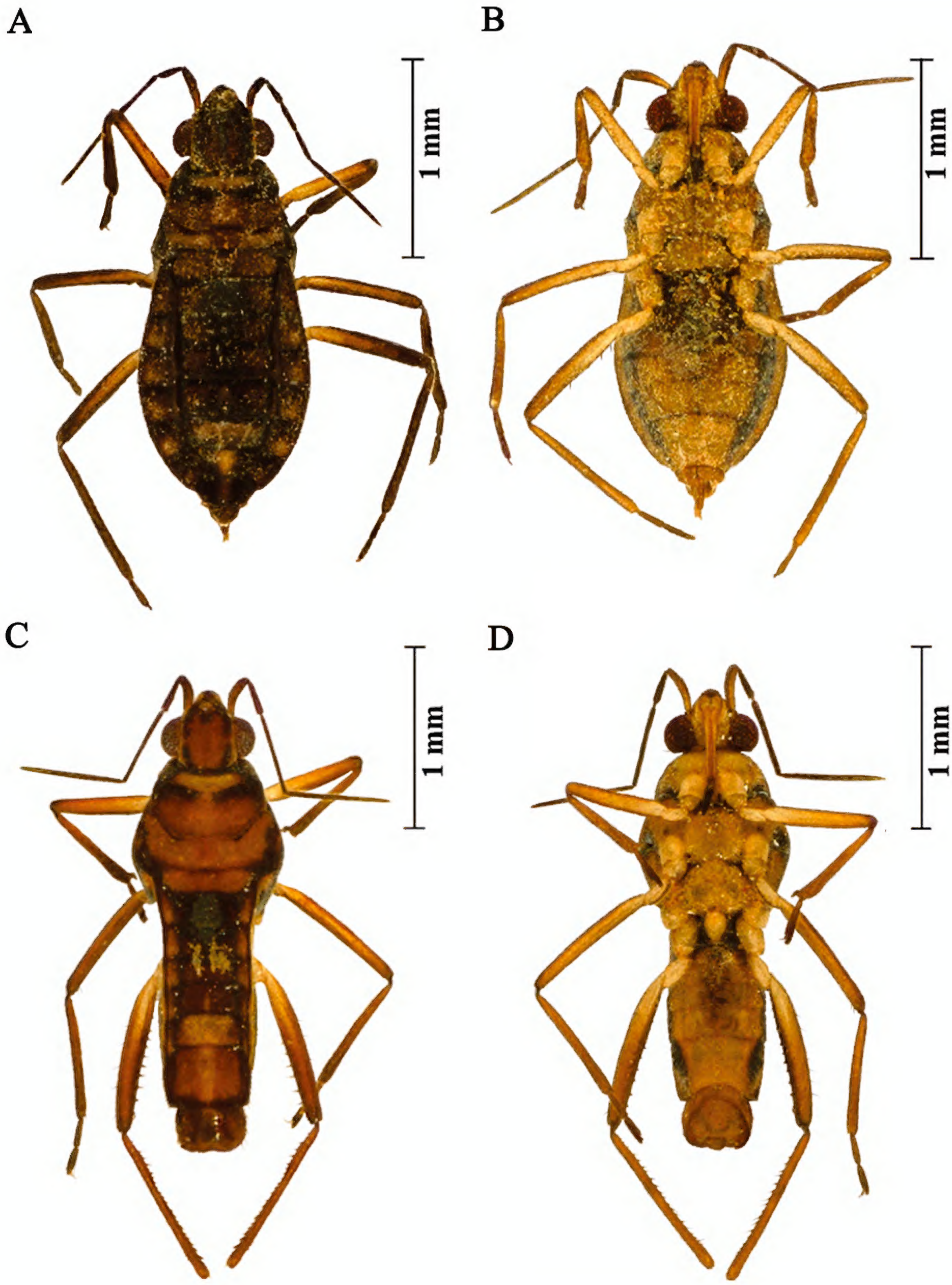

Figure 3. *Microvelia albonotata* collected in Miravalle Cave, Boyacá, Colombia. **A.** Female, dorsal view. **B.** Female, ventral view. **C.** Male, dorsal view. **D.** Male, ventral view.

through altitudinal gradients and implementations of its incorporation in projects of social appropriation of knowledge and the effects of climate change, Boyacá. BPIN 2020000100003". EAAA also thanks Valentina Gaviria for her guidance inside the cave and for the collaboration in collecting the specimens. FFFM benefited from grants provided by the Conselho Nacional de Desenvolvimento Científico e Tecnológico (process 301942/2019-6) and the Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro (processes E-26/201.362/2021 and E-26/200.649/2023).

Author Contributions

Conceptualization: EAAA, IM. Data curation: IM. Formal analysis: EAAA, IM. Investigation: EAAA, IM. Methodology: EAAA, IM. Resources: FFFM, EAAA. Software: EAAA. Supervision: IM. Validation: IM, FFFM. Visualization: EAAA. Writing – original draft: EAAA, IM. Writing – review and editing: EAAA, FFFM, IM.

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